THE TWO DISCIPLINES IN EDUCATION.

AN ADDRESS

DELIVERED AT THE OPENING OF THE MEDICAL SESSION.
MASON UNIVERSITY COLLEGE, BIRMINGHAM,

BY

SIR WILLIAM T. GAIRDNER, M.D., K.C.B., LL.D., F.R.S.,

PROFESSOR OF MEDICINE IN THE UNIVERSITY OF GLASGOW.

BIRMINGHAM: CORNISH BROS.
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NOT very many weeks ago, I had the opportunity of spending a long summer day in the country with a friend who, if I were to name him to you, would be recognised by many here as one of the foremost men, and one of the greatest authorities, in medical science; and along with this old friend, we had one of the very foremost physicians of the American continent, a guest for the day like myself, in a most beautiful country within easy hail of London, amid the downs of Surrey. The occasion was one which might have led to discussion of some of the points I intend dealing with in the present address. I do not remember that there was much, if any, discussion of that kind among us, and yet I have something like an instinct that you may take what I shall deliver to you as being substantially in harmony with the views and opinions of these eminent colleagues. One thing, however, I may here mention as having taken some hold upon my own mind, that of a life-long teacher of medicine. This was a lecture given by our host, in the afternoon, to a mixed audience of all ages and ranks, within an "educational museum" that owes its existence in this sequestered village to the energy and restless fertility of resource that characterise my friend alike in his professional career and in his relaxations—if so they may be called. This lecture was one of several carried on at intervals during the summer and autumn, under the auspices of a local committee with whom the museum is vested as a trust. It goes without saying that the lecture was no common one—it could not have been so, considering the lecturer—but as it is with the method more than with the matter of the discourse that I am concerned at present, I will venture to use it as an illustration, without too many details. One thing, however, particularly struck me, in the very commencement of this altogether remarkable lecture. It had been announced that the first twenty minutes or half hour would be given to some common object or objects freshly provided, while the remainder of the discourse was to be upon "Whales." In this first portion the key note, as it were, was struck by presenting to an intelligent little maiden of perhaps twelve years old, sitting near the lecturer, a severed branch of a fir tree just imported from the adjoining woods, and asking her—"What is that brown object growing in the cleft of the branch there?" "A pine cone?" "No, it is not a pine cone, though it may look a little like it. You see it has some of the green leaves growing out of it. Now, take this knife, and cut what you supposed to be a cone down the middle." This cut being performed revealed an insect inhabiting the woody growth, and this led to a few minutes' discourse on these animal parasites, or galls, in their more general relations. Then followed an exhibition of potato blooms, so recently recovered in our fields after many years of almost entire absence; with some remarks on the possible causes of these changes; but, as I have said, the details of the lecture being of less consequence for my present purpose than the method of it, I will pass over what was said upon this subject. Interest being thus thoroughly aroused, alike among old and young hearers, by this dealing with common objects, the main subject of the lecture as announced was proceeded with, and proved to be a most philosophical, though by no means too abstruse, discourse on dried specimens in the museum, of the structure of certain whales and their congeners, the dolphins, narwhals, etc., etc.; following out the lessons to be derived from the modifications of the skeleton and the dental apparatus in different tribes of animals more or less resembling each other, as viewed in the light of Darwinian principles by a thorough and experienced student of nature. It was a lecture, which, from plain and simple, very visible and very tangible facts, presented in the first instance objectively (to use a comparatively modern philosophic word), extended up to very general and somewhat recondite laws of nature; but above all, it was a lecture which had "Nature" for its groundwork and its basis, observation of Nature for its primary method; and which thus tended to quicken, or educate, in an equal degree, the faculties of observation and those of reflection.

THE METHOD OF SCIENCE.

In the course of hearing this admirable exposition, and noting at the same time, the very vivid and unfeigned interest displayed in it by old and young alike, I was led into some considerations which were not by any means new to me (as you will presently find), but which I have since thought might be turned to account as a fitting basis for the present address. Observe, once more, that it is the method, and not the matter, of this teaching on which I desire your attention to be fixed, as students of medicine. It would be going too far, perhaps, to affirm that the method here in question is the exclusive method of medical science or of any other science. But it is, in a broad and general sense, the method of *Science*, as distinguished from *Literature* and *Philosophy*, which, in days not very long past, well-nigh monopolised the field of education, and seemed to many generations of our ancestors to comprehend, if not to exhaust, all the available faculties of the human mind. My desire is, not to disparage literature and philosophy, much less to insist upon these, or any department of them, being supplanted by newer methods in education; but to show that what I have already called the *objective* method has, and ought to have, a quite definite place in all education, from the infant school up to the University; and that to refuse or deny to it this proper place is practically to arrest the growth of certain faculties which are at least as important in the evolution of an educated human being as are those which have for ages been subjected to the disciplinary methods commonly called scholastic, inasmuch as these methods have had almost the undisputed possession of the schools, and therefore of the minds trained in them. My argument will be, not that the scholastic discipline is bad of its kind, but that it is, or at least has been, defective; not that its results, so far as attained, were otherwise than most important and valuable; but that other results, which should have grown up side by side with these, and in perfectly harmonious association with them, have been artificially withheld and denied the opportunities of development which they might have had, and would have had in a complete and well-balanced educational system.

This complaint is not new. The late Professor Huxley, in the course of a long and busy life devoted in almost equal proportions to science and to controversy, omitted no opportunity of urging the claims in education of the kind of discipline here referred to; and in his case the brilliancy of his own literary gift, and the luminous powers of exposition which he applied to certain philosophical topics, forbade the idea often—and perhaps in some cases justly—entertained of the mere scientist, that in the riding of his own hobby he would willingly ride over, or at least would be utterly careless of, everything else that came in the way. Moreover, in his lecture—"On a piece of Chalk"—Huxley has left to us a practical and outstanding illustration of the kind of wide scientific outlook that may be based even upon a very common object, and of the singular attractions which such an exposition may have—and ought to have—for all minds that have not been already fatally distorted by overmuch and exclusive training in book-lore, and the merest pedantry of current educational systems. And almost, or quite a generation before Huxley, when, indeed, that brilliant and combative genius may have been (for aught I know) among the early entranced child-listeners at the Royal Institution, Michael Faraday was experimentally unfolding and expounding the "Chemistry of a Candle" to audiences which, although the simplicity of the treatment was such as to fascinate children in their Christmas holidays, and was in the first instance intended for them—came to include also many of the most gifted statesmen, philosophers, and adult persons of social eminence, in London.

FARADAY ON ENGLISH EDUCATION.

These lectures at the Royal Institution, by one who is confessedly one of the greatest scientific investigators of the present century, were probably responsible in some degree for the first effective protest against the one-sidedness of the scholastic methods as then pursued; for in 1855, Faraday (although with characteristic modesty he confessed himself to be "not an educated man") affirmed, in presence of Prince Albert and a large assembly of highly cultivated and socially notable persons, his clear conviction that the most highly educated minds in this country were often entirely undisciplined in the merest elements of the knowledge of *things* as opposed to *words* and abstract ideas, and that these minds, even in mature age, remained impermeable to truths which to one with any scientific discipline at all were all but axiomatic.

Faraday was not only assured by his own experience as a teacher that very young minds were open to receive, and ready in apprehending, the data and inferences resulting from well-conducted experiments, but he had also had before him the fact that in the most highly cultivated classes in English society persons were to be found on whom experimental and physical evidence failed to make any impression at all, when brought into contact with an *a priori* conviction, however foolish and absurd. The crude impostures of table-turning, spirit-rapping, and other quasi-supernatural manifestations were at this period in full flow of their fashionable popularity; and Faraday, who was, withal, a man of the most sincere and profound religious faith, maintained without hesitation that these materialistic communications, alleged to be from the spirit-world, were, as such, wholly unreal and misleading. As regards some of them, he proved to demonstration, by physical experiments of a remarkably simple kind, that this was so. But still the great world, and the fashionable world of society went on believing, and furnishing converts to wholly exploded fallacies. Faraday was thus led to the conviction that there was a grave deficiency in the scholastic discipline of very high-born and distinguished Englishmen in his day; and in 1862 he obtained the opportunity of explaining and impressing this opinion more at large before the Public Schools Commission of that date.

When addressing the British Medical Association from the President's Chair, in Glasgow, in 1888,* with special reference to the demands of medical education, I had occasion to cite this testimony of Faraday at some length, with the view of showing that although some response had even then been made to his modest representations, supported as they were generally by the Public Schools Commission already referred to, and still further by a later Commission on Scientific Instruction in Public and Endowed Schools in 1875, there was still much to be done before the lessons read to the first of these Royal Commissions by this great master in science could be said to have had their just effect. Faraday was himself fully aware of the difficulties, and even dangers, of prematurely urging, or rather forcing, the claims of science-teaching; and no one could be less open than he to the reproach of having made revolutionary proposals in favour of science, to the detriment of the older and more established scholastic discipline. Others were no doubt much more impulsive, or less restrained, or less unwilling than he was, speaking always as he did in the character of one who was "not an educated man," to carry war into the camp of the humanists. In the admirable "Romanes Lecture" recently published by my former colleague, Professor Jebb,* I find generally that the sixties—*i.e.*, the years immediately following the report of the Public Schools Commission—are referred to as being the critical moment, "a moment in this century when the attack upon the humanities was somewhat formidable." It is very satisfactory to note that, as the result of his whole investigation of the subject, Professor Jebb considers that the humanities have successfully weathered this storm, and are now, towards the close of the century, in a stronger and more secure position than they were before. "In the sixties," he writes (p. 35), "considering the strength of the attack both from without and from within, the position of humane studies was certainly more seriously imperilled than it had ever been before. . . . The danger was lest the powerful alliance between insurgent men of science and disaffected humanists, aided by the legions of Philistia, should force on a movement for imposing restrictions in a spirit altogether favourable to the new studies, but unfriendly to the old; with the result that classical studies might be so narrowed, so hampered, so maimed, as to lose nearly all their educational virtue: and, after languishing for a time, might gradually die out of the schools."

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* "The Physician as Naturalist." Glasgow. James Maclehose & Sons, 1889. Also in *British Medical Journal*, 11th August, 1898.

The other side of the question is stated not less candidly, though not, perhaps, with the same fulness of knowledge as regards scientific results and methods, by Professor Jebb, as follows (p. 37):—

"In the last thirty years the position of the humane letters, relatively to other studies, has been altered in several important respects. The study of the natural sciences is now firmly established in schools and universities; it can no longer be said that a haughty and exclusive humanism keeps them out of the educational field; indeed, there are not a few seats of learning where they hold a clear predominance. . . . This establishment of the modern studies is, so far as I have seen, viewed by humanists generally with cordial satisfaction. The spirit of humanism, indeed, wherever it is not a narrow pedantry, is one which welcomes every accession to the domain of sound knowledge. Meanwhile, the claims of humanism itself, sifted by a period of controversy, and illustrated by larger views of liberal education, which now prevail, are usually stated with more discrimination than formerly, and are more willingly and more widely acknowledged."

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* Humanism in Education. By R. C. Jebb, Litt. D., Hon. D.C.L. Macmillan and Co. 1899.

THE "ATTACK" ON HUMANISM IN THE SIXTIES.

This is surely a very satisfactory result, so far, of a controversy in which, as I have all along held and maintained, the two parties that have appeared as jealous rivals in the educational field, ought in reality to have been the best of friends; inasmuch as each of them was pursuing an end quite necessary in itself, and one which, rightly understood, so far from excluding, or being incongruous with the other, ought rather to have been considered as giving it the support and assistance required in working out a common purpose—the all-round evolution, or education, of the faculties of the human mind. But I am by no means convinced that the "attack" (to use Professor Jebb's expression) on humanism, which is attributable to the introduction of the methods of natural science into education, has by any means exhausted itself, even now. All the more, therefore, I am grateful to the Romanes lecturer for making it clear to me and to all men that the danger which was so seriously apprehended in the sixties, has been averted, or (as I should put it) shown to be really no danger at all; and that everything in humanism that is most of its essence, and therefore of most abiding value, has not only survived this "attack," but has become stronger and more broadly and truly human, through the trials to which it has been exposed. Partly by getting rid of certain pedantic and deeply engrained defects of method, and partly by the development of quite new kinds of interest in the old and traditional studies. the classical and other pursuits which constitute humanism have been strengthened, rather than weakened, by the intrusion of the new or more modern elements in education. As Professor Jebb himself puts it (p. 34) "the humanistic studies have, during this century, become wider and more real. They have gradually been drawn out of a scholastic isolation, and have been brought more and more into the general current of intellectual and literary interests. So far from losing strength or efficiency by ceasing to hold that more exclusive position which they occupied two or three centuries ago, they have acquired a fresh vigour, a larger sphere of genuine activity, and a place in the higher education which is more secure, because the acceptance on which it rests is more intelligent."

DANTE—PETRARCH—ERASMUS. THE ITALIAN RENAISSANCE.

It would be very unbecoming in me to attempt to add anything now to the force of these words, carefully set down as the result of a life-time of experience and research by perhaps the greatest of our living humanists, a friend and (I am glad to recall the fact) an ex-colleague of my own in the University of Glasgow. But I may be permitted to remark that this hopeful and tolerant attitude of mind, towards the changes in our educational policy that have been gradually taking place since the early sixties, has been by no means universal; and that the admission of the new methods and new forces of scientific training into our educational system has been very grudgingly, and often inadequately conceded by those who, themselves trained on the older lines, and being officially masters of the situation, have treated all innovations as hostile, and their authors as enemies to culture instead of friends in disguise. Perhaps there may also have been a spirit of undue aggression and even contempt on the other side, among those who have written and spoken as if the so-called "modern" studies were all-in-all in this nineteenth century of ours. To such over-zealous partisans the *apologia* of Professor Jebb may be commended, as a temperate, careful, and I need scarcely say thoroughly well-informed historical and argumentative statement of the claims of "Humanism in Education." He attributes to Petrarch the honour of being the pioneer in "that great movement which we call the Renaissance." Dante, who was thirty-nine years old when Petrarch was born in 1304, was the last great (and perhaps the greatest) figure of the middle age "standing in the borderland between the darker ages and the revival, when he shows us a keen intellect and a sublime imagination moving within the limits, and obedient to the forms of mediæval thought." "At the further verge of the Renaissance" (and at quite two centuries distance from Dante) we have "Erasmus, the life-long antagonist of the schoolmen, who makes so vivid to us the contrast between the intellectual atmosphere of scholasticism and that which the humane letters had created" (p. 6). And in these two centuries no one surely, will now attempt to deny that the human mind awoke as from a slumber, and entered on a new course of life and activity, as a consequence of the Italian revival in the 14th century. "Petrarch's ideal of humanism," says Professor Jebb (p. 7) "as a discipline which aims at drawing out all the mental and moral faculties of man, pervades the whole course of the Italian Renaissance."

That this ideal was not always attained; that it was "often obscured by affectations or puerilities," and "not seldom belied by evil living"—a kind of revived Paganism, in short—Professor Jebb frankly admits. But, all the same, it was "a real force, which comes out more or less in all the greater and nobler of the humanists." To all this, considered as the history of a great movement which began more than five hundred years ago, and has had an abiding influence on the educational methods of all European countries, one can readily assent, while maintaining, with Faraday, Huxley, and all the great scientific authorities of the present century, that the discipline of humanism requires now to be supplemented by a newer and different discipline; and this, not merely, and not chiefly, on account of the utilitarian value of the latter, but in obedience to the very principle attributed to Petrarch, that education, in the large and liberal sense of the word, should be such as to "draw out all the mental and moral faculties of man."

It is with a view to this distinction, that I have ventured to give this Address the title of "The Two Disciplines," and I hope to show you, before I have done, that without at all disparaging the first, or older discipline, that of the Renaissance, commonly called Humanism; the second, which finds its objects in the physical facts of nature, and its methods, generally, in those of what we call physical and natural science, must be firmly upheld and pressed home, until it permeates every phase of education, as I said before, from the Kindergarten School up to the University.

WHAT THE RENAISSANCE FAILED TO DO.

The great men of the Italian Renaissance, owing to the very fact that they were so exclusively and completely preoccupied by the revival of learning, and mainly of classical learning, could not be expected to perceive that learning, even if we include in it philosophy as well as literature, and mathematics as well as philosophy, does not by any means exhaust the cycle of human faculty. It would have been indeed marvellous if, in an age when astronomical science, founded in genuine and on the whole exact observation of nature thousands of years ago in Chaldæa, and methodised (though erroneously) by Ptolemy, had degenerated into astrology; when chemistry (whatever there may have been of it) had passed into the visionary search for the philosopher's stone and the elixir of life; when biology, pursued at least on a large basis of observation by Aristotle, had become absolutely inept, and a mere repetition of verbiage attributed, and often ignorantly attributed, to the ancients; when anatomy, founded at least on something like personal observation in Galen's time, and carefully pursued by Erasistratus and others in the Alexandrian school, had altogether perished, and was, indeed, forbidden by authority; and when the science and art of medicine, so necessary at all times for the preservation of life and health, had become a mere craft, with such learned equipment as we read of as Chaucer's "Doctour of Physike;"—in such an age as this, it would have been more than human if the pioneers of the Renaissance had ever thought of placing the discipline of science, or of any kind of observation of nature, upon their programme of an all-round education of human faculty. In their revival of classical learning, they had the support and patronage of popes and of Medicean princes, even when the trend of the new studies seemed to be in the direction of sheer paganism alike of thought and of life. It was safe enough to denounce, or to ridicule, the pseudo-sciences of the time; and this (according to Professor Jebb) the humanists did, and did effectually, especially as regards astrology; for "from Petrarch onwards" he says (p. 15) they "made open war on this flourishing imposture." But the discipline of true science (or of natural and physical phenomena) was a very different thing from this negative attitude towards its counterfeits; which may, however, be placed to the credit of the humanists. From no pope or Medicean patron in those days could any effectual assistance have been expected, either in genuine and fruitful investigations of the *arcana naturae*, or in teaching the methods of "science" as we now understand them. The fate of Roger Bacon, in the century immediately preceding Petrarch, and of Copernicus and Galileo later on, remain for us as standing monuments at once of the dangers that waited upon the pursuit of physical science in mediaeval times, and of the small share that the movement called the Renaissance can claim in advancing these pursuits to a place in the education of humanity.

A NOTABLE PHRASE OF J. C. SCALIGER.

There was, however, at least one humanist, of the latter period of the Renaissance, who by a single brief epigrammatic phrase, has managed to shew that he, at all events, was not wholly insensible to the value of a discipline such as Faraday advocated and practised, and such as we are now considering in this address. The Scaligers, though they bear a name of distinction, were not, perhaps, in the front ranks of the humanists, and certainly did not do very much, in their day, for the advance of science. But the elder of the two, Julius Cæsar Scaliger, was trained as a physician, and I believe, practised as a physician; and in writing to another and perhaps more eminent physician, Jerome Cardan, somewhere about the year 1557, in the course of a long, desultory, and somewhat unreadable dissertation* "De Subtilitate" he has formulated the following very notable phrase, pointing, as he seems to think, to something wanted in the educational tendencies of his time. The special subject in view is Rock Alum, and the fallacies current in respect to it; and I am certainly not here to allege that the reflections of Julius Cæsar Scaliger on Rock Alum have any kind of resemblance to those of Mr. Huxley "On a Piece of Chalk." But it is something, surely, to have compressed into seven brief words of Latin an idea so foreign to the humanism of the Renaissance as the following:—*Rerum ipsarum cognitio vera e rebus ipsis.* If Julius Cæsar Scaliger had been Michael Faraday, and if he had lived in the nineteenth century instead of the sixteenth, he could hardly have given a more complete and condensed expression than we find in these words to the defect in the purely humanistic programme of education on which Faraday so strongly insists in his evidence before the Royal Commission in 1862. What Faraday deplored as being defective in the most highly educated Englishmen of his day was the knowledge of *things* as opposed to *words and abstract ideas of things*—or, in the phrase of Scaliger a true cognition of the things (or objects) themselves, taken directly from the things themselves. The argument of the highly-educated grammarian of the 16th century was that the want of this direct knowledge of things led to some curiously distorted views about rock alum and many other natural phenomena. The contention of the "uneducated" philosopher of the 19th century was that the "want of judgment in natural things," and the "great deficiency in the power of giving the reason why" were such among the educated class as often to defeat the ends of justice in courts of law, and to lead to the most humiliating exposures of confident ignorance and presumption in matters of fact; and all this in the case of persons who had received every advantage, and who, in all kinds of learning and in the discipline then provided in the schools, stood in the front rank of Englishmen. And here it was, that the almost unique experience of Faraday—unique at least at that time—came to his aid; for he had found personally, in the course of his lectures in the Royal Institution, that the elementary ideas of the "judgment in natural things" were not only easily conveyed into the minds of children, but had a peculiar fascination for them. "The young mind," he says, "as I find it . . is very observant and asks most acute questions. I do not find it, generally speaking, backward to understand a statement I make in simple language; and if I tell him this or that . . . and then shape it into a question, he can generally answer me. I must confess to you that I find the grown-up mind coming back to me with the same questions over and over again. . . . Their minds are not prepared to receive or to embody these notions, and that is where you want education; to teach them the A B C of these things. . . . I never yet found a boy," he says in another place, "who was not able to understand by simple explanation and to enjoy the point of an experiment."

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* Exotericorum Exercitationum Liber xv. de Subtilitate Exerc. 104. Sec. 6, "de Alumine Rochae." I quote from the edition of Francof. 1612; but there are various editions from 1557 onwards.

I am repeating, Gentlemen, in these quotations from Faraday's evidence, and in some of the remarks attached to them, the very words that formed part of my Address to the British Medical Association in 1888. But I think you will concede to me that the words are worth repeating. Here is a master in science, if ever there was one; but one who, nevertheless, proclaims himself "not an educated man" according to the conventional views of education in this country. He does not, however, express any resentment at the current discipline, or any desire to attack or destroy it. "I should be very sorry," he says, and evidently with conviction, "that the introduction of science should be an injury to any other branch of knowledge." All the same, however, he insists with the confidence of one who thoroughly knows what he is speaking about, on the disastrous effects of an omission which he finds in the highest and most coveted English disciplines of his own day. And this omission is practically identical with that foreshadowed by the man of the Renaissance, Julius Cæsar Scaliger, in 1559—*Rerum ipsarum cognitio vera e rebus ipsis.*

THE TWO DISCIPLINES CONTRASTED.

In thus insisting on this old and half-forgotten expression, I do so not because it had any considerable effect at the time, or because it had much apparent significance in relation to the career either of Scaliger or his correspondent Cardan; but because it formulates for us now more exactly and more briefly than any other words I can devise, the kind of discipline and method which in the commencement of this address I had it in view to illustrate, and which it was Faraday's object to introduce more largely into education. The essential difference of the "Two Disciplines" (as I have ventured to call them by way of contrast) is that one is based upon ideas which have already received expression in human speech; while the other is concerned chiefly with objects, that is, with phenomena occurring in external nature. The former discipline accordingly is (whatever else) necessarily preceded by and mainly founded on linguistic studies, and keeps close to them throughout, inasmuch as language is not only the vehicle of ideas, in respect of their intercommunication; but (as Max Müller has so cleverly put it) the λόγος is at once the word and the thought; the one being in a practical sense inseparable from the other. Hence the trend of this discipline is towards *humanism*, i.e., towards the discovery and highly elaborated study of the best models and examples alike of thought and of expression; the noblest and most inspired ideas of the most outstanding men, clothed in the most appropriate and (if it may be so) beautiful, but at all events fitting and luminous, words. The men of the Renaissance found this kind of perfection in the literatures of Greece and of Rome, and directed all their energies to the revival of these, and to living over again, and thinking over again, the best ideas of classic antiquity. Nor is there anything to be said against this noble humanistic ideal, as it presented itself to Petrarch in the 14th, or to Professor Jebb in the 19th century, except what the latter, indeed frankly admits. Humanism may be "obscured by affectations or puerilities," it may be "belied by evil living," founded on the too admiring familiarity with Pagan practices and habits of thought; or it may, as a discipline, become much too technical—as sometimes in its grammatical developments, to be a good all-round education, even for a humanist. For, as we read in the Romanes Lecture (p. 27), "the modern specialist in certain branches of classical study, may come perilously near to passing out of the province of humanism."

"LOGOS" AND "PHUSIS."

Such, then, are the leading characteristics of what we may call, historically, the older and, until recently, paramount scholastic discipline, founded mainly on language, and including in its widest range philosophy and mathematics, which are also, as studies, only to be compassed through verbal symbols and definitions underlying their whole argument. This discipline begins in the individual man with the actual A B C, or rather with the first spoken words of the child, and is methodised and expanded in the school and university either into humanism of the classic and renaissance type, or into some other variety of literary and philosophic evolution founded on this, but more largely permeated by modern ideas. Having in view the contrast I am about to present to you, and also the large and comprehensive interpretation placed upon the word by Max Müller, I am disposed to indicate the whole of this discipline in one Greek word, and call it the discipline of λόγος.

But now let us revert for a moment to the other discipline, which occupied our attention in the beginning of this address—and which, instead of calling it by the ambitious title of the discipline of science (although it deserves to be so-called) I prefer now to consider under its simpler and more universal aspects, as the discipline of *φύσις*, *i.e.* of nature and natural phenomena. I have already employed this expression for it in my former address, and have had occasion to point out that by a very ancient tradition embodied in the name *physician*, the medical art and its professors of the higher order have been all along supposed (sometimes it is to be feared erroneously) to be specially imbued with this discipline, or at least to have a quite special interest in it as the only fruitful method of medical science. It is, moreover, true at least of Hippocrates, the Father of Greek medicine, that he anticipated by some two thousand years the well-known expression of Francis Bacon, by indicating the true position of the healer as being ὑπηρέτης φύσεως—the servant (or minister) of nature. And, if further evidence were required, the very foundations of what we now call Biology, pursued in relation to the art of healing, came to be spoken of at a very ancient date as Physiology—the doctrine, or λόγος of φύσις—a designation which it has retained till our own day. There is thus a reasonably good traditional ground for the position in which we stand to-day—in this flourishing medical school of a nascent University—pleading for the more ample recognition of the discipline of φύσις, in relation to general education.

It is perhaps worthy of note here, that in the natural order of evolution of human faculty as regards the individual, the discipline of φύσις is first, that of λόγος second. The latter commences with the first words spoken or apprehended by the infant, followed up in time by the A B C. But the A B C of φύσις begins in the cradle, in the very first hours of conscious life. The whole existence of the infant is a discipline—sometimes a painful, oftener a joyous one, in the wide school of natural phenomena. His very primordial instincts, the play of hands and feet and lungs and voice, tutored and guided by experience, are a part of that natural discipline. To learn that fire burns, and that water cools and cleanses; that iron is hard and heavy, while wool is soft and light; that colours, sounds, tastes, and smells differ, and may mean good or evil, help or hindrance, in particular circumstances; these are the first steps in the discipline of *φύσις*, and are learned, as a rule, with great ease and confidence, though not without mistakes, from experience, long before the A B C of the other discipline has begun to be thought of. In the admirable kindergarten schools of recent times, moreover, the discipline of *φύσις* is often attended to and aided by well-contrived efforts and experiments, increasing both knowledge and power without any sense of task-work, or fatigue of body or mind, and with the clearest proof of enjoyment on the part of the child. But, so soon as the discipline of λόγος comes in, monopolising the attention and making drafts upon the intellect in the shape of memory and task-work, the more natural discipline is apt to be thrown aside or even severely repressed, as being unprofitable in a scholastic sense. At the very least, it fails to be methodised and expanded, and is not turned to account either in a scientific or any other direction, as the discipline of λόγος is when it carries off all the tangible rewards, and in fact becomes exclusively what is called "education" on the lines of humanism, as we have just seen.

Fortunately for the human race, however, the discipline of *φύσις* is not confined to the schoolroom. The fisher learns a good deal of it in this commonest of sports in studying the habits of the *salmo fario*, or even of the minnows in the pool in childhood, and does not dignify what is so learned with the name of "science." The child addicted to bird-nesting, the collector of flowers, or of insects, of seaweeds, or any other natural productions, acquires a hold thereby upon one or other corner of abounding "Nature," which may or may not be wisely cultivated. In every kind of sport, in almost every occupation pursued in the country, *φύσις* will have her votaries and, up to a certain point, her successful students. A Gilbert White will indulge to the full his wonderful instinct for the observation of nature even in a quiet country parsonage, and will give us the "Natural History of Selborne." A Hugh Miller of Cromarty, combining a fine literary instinct for "humanism" with native scientific genius, will tell you years afterwards that the best part of his early education at the parish school was on the days when he "played the kip" *i.e.* the truant, and devoted himself to long walks, taking in slowly the lessons which afterwards came out in "The Old Red Sandstone," and "The Testimony of the Rocks." But such brilliant aberrations of scholastic discipline only bring to mind the old Latin proverb—*Naturam expellas furcâ tamen usque recurret.* Faraday's principle is that the great natural aptitude which most boys display for observation and experiment ought to be fostered, and not hampered, in a general scheme of education. No doubt, the more recondite and abstruse generalisations of "science"—especially those which involve mathematical considerations—are beyond the scope of most boys at school, as they are of most men even at a later period. But that is no reason for rejecting the discipline that arises from much more simple and easy demonstrations of φύσις. The lectures "On the Chemistry of a Candle" were of this description, and they have been published. They were intended to shew, and did shew, that most important scientific generalisations, resulting from experiment, and actually demonstrated in presence of a juvenile audience, could be made perfectly clear to the minds of school-children, if presented in simple language by one who was a master in the subject.

FARADAY'S DIFFICULTY—TO FIND THE TEACHERS.

It was at this point, however, that Faraday did not fail to foresee a difficulty which is even now, perhaps, not unlikely to endure for some time to come. Where are the masters to come from? In his own days he said, "I am often asked what men to recommend to spread a knowledge of natural physical things. I cannot recommend such; such men hardly exist at present. They want the A B C of science, not the X Y Z; they want the first elements." Faraday was well aware that a mere scheme for teaching "science" among a lot of what are commonly called "modern subjects" would not work. "It is not the matter," he said, "it is not the subject so much as the man. You want men who can teach (science) and that class has to be created." Faraday knew well (though he did not put it exactly in these words) that "science" (so-called) might be taught out of a text-book, by rote, like anything else, and in such a way as not to have the smallest relation to the discipline of φύσις. The one essential point in that discipline, as distinguished from that of λόγος, is that the teaching must be real of its kind, founded on experiment and observation directly, and not doctrinal. It must be, in short, *rerum ipsarum cognitio vera e rebus ipsis.*

Now in the actual teaching of a medical school in these days, gentlemen, we do our very best to make this kind of teaching yours as far as we can. You are taken into the dissecting-room and are expected to learn for yourselves (with assistance of course)—to make yourselves practically familiar with the anatomy of the human body by the work of your own hands and senses. You have to undergo a similar discipline in the chemical and physical laboratory, and again in the physiological, and again in the pathological laboratories, and in many others. In the great practical departments, you have your clinical work in the hospitals, which, if well managed by competent men, ought to be all a part of the discipline of φύσις and nothing else. A certain amount of dogmatic instruction by lectures and text-books, it is true, is absolutely indispensable, and I am not here to disparage it, as I have long practised it myself, and have fully discussed elsewhere the need that still exists for it * But every systematic teacher of any eminence or effectiveness will tell you, that if he were deprived of his practical service, his teaching, even as a systematic and more or less doctrinal lecturer, would inevitably degenerate. Here again, therefore—*rerum ipsarum cognitio vera e rebus ipsis*—is the true note of the discipline of φυσις. If general doctrines and conclusions must needs be taught, they should be taught as much as possible in the light of instances; and the more these can be freshly provided and brought before the senses of the learner, the better.

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* Two Lectures. I. Lectures, Books, and Practical Teaching. II. Clinical Instruction. University of Glasgow. Session 1877-78. [The first of these Lectures was printed in part in *The Lancet*, November 17th. 1877. The second has been mostly used for distribution to my clinical classes, as an exposition of the method to be pursued. Both Lectures are now out of print.]

But the question which I am here to discuss to-day, though it is one of medical education, is also one of general education as this will, I trust, come to be largely moulded and dominated by the Midland University of the future. Would not medical education be greatly improved, and rendered easier as well as better in quality, if the well-nigh lost discipline of *φύσις* were to be restored, in some appreciable measure, to the "grammar school?" Nay, would not the discipline of letters itself be improved, were it to become a fundamental principle in all education, from first to last, that *λόγος* and *φύσις* should go hand in hand, each of them, of course, in a measure suitable to the advancing intellect and general growth in faculty of the child or adolescent? My argument is that this ideal, though perhaps difficult of complete attainment now, and for some time to come, is not impossible, nor yet in any true sense injurious to the older discipline. I take it on the authority of Professor Jebb that the "attack" on "Humanism in Education" in the sixties has not been really disadvantageous to the latter, but rather, by purging humanistic studies of pedantic excrescences and methods, by drawing them out of a scholastic isolation, and bringing them more into the general current of intellectual and literary interests, has actually strengthened their position by making them "wider and more real." Now, if all this be true as regards the higher education, why should not the same principles, and with a like result, prevail also in the grammar school? Observe that I purposely avoid the use of the words "science" or "scientific teaching" here, because we may be dealing (as Faraday said) only with the A B C, and not with the X Y Z; and further, because "science" may be crammed out of a text book after a fashion that makes it no more a discipline in *φύσις*, than are the rules of prosody, or the genders of Latin nouns, or the declination of Greek irregular verbs. But when the proper kind of teachers can be obtained (and that is the greatest difficulty now, as it was in Faraday's time) the discipline of *φύσις* will make as great and as beneficent a change in the grammar school as it has already, in part, done in the Universities and seats of the higher and more advanced learning.

On this point I find little to alter in the language I employed in 1888, a few sentences of which you will perhaps excuse me for repeating, as I cannot find any other or better terms now for expressing the changes which I have in view. "Our present programme of school discipline is still too largely founded on the idea that at six or seven years old, as the case may be, a child may be withdrawn, in a great measure, from this strictly natural, wholesome, and all-round education of the faculties (*i.e.*, that of babyhood and of the kindergarten school), to have his nose buried for ten long years in books and papers, and mental and other arithmetic, till his little eyes become myopic, and his little brain suffers a corresponding deformity. Athletic sports, as a counterpoise, are no doubt good, and industrial training better, in some cases, especially among the children of the poor; but they do not supply the missing link, which can only be found in the early discipline of *φύσις*, pursued in the very spirit of Faraday." To which I should only wish now to add, in parting with that great man on the present occasion, a few words from his evidence on this very point, in reply to a question as to what he thought of the ordinary grammar school discipline in this respect. "It does not blunt the mind," he said, "but it gives the growing mind a certain habit, a certain willingness to accept general ideas of a literary kind, and to say that all the rest is nonsense. . . . It takes up the general impression that a certain kind of knowledge, what I call the real knowledge, the knowledge of things, is of no importance."

A QUESTION FOR THE GENERAL MEDICAL COUNCIL.

I will close with a single remark, which may have the effect, considering that my audience is chiefly concerned with medical education, of showing you that the higher orders of schools are, even now, awakening to the demands that may be made upon them in this respect; and that some, at least, of the medical examining bodies are not indisposed to encourage this movement in advance. I was obliged to separate myself at the last meeting of the General Medical Council from (I believe) all, or most, of my Scottish and Irish friends, and to vote in a minority with the representatives of the English Corporations. The occasion was this. You are aware that the medical curriculum has been, within the last decade, extended to five years; and even with this extension, it is still overcrowded and likely to become more so as the demand for special practical subjects, to be included in the curriculum, increases. Now, Mr. Huxley many years ago suggested, in the interest of course of scientific education as he conceived it, that the strictly medical training of the university and medical school proper might be lightened by getting some of the early discipline, in elementary physics, chemistry, and biology into the schools, to be pursued side by side with the more ordinary scholastic discipline, before the usual age of commencing strictly medical studies. Although this suggestion was not taken up at the time, at least to any very appreciable extent, it now appears that a good many English schools of the higher kind have, by engaging science masters, and providing sufficient laboratories and apparatus, been placing themselves in a position to claim that this kind of instruction may be communicated to their pupils to such an extent as to enable them to pass either the whole or some portion of the first professional examination. The English Colleges therefore determined to recognise, after due investigation, such schools as appeared to them to be capable of giving, or rather to be actually giving, such instruction as is real and valuable in these subjects. The Irish Colleges, on the other hand, objected to this new departure, on the ground, apparently, that "grammar schools" are not, and should be practically debarred from becoming, schools of "science" in any such sense as should form part of a medical curriculum. Observe, that it is conceded on all hands that five complete years after registration as a medical student, must be devoted to professional studies conducted at a medical school. The attempt, therefore, to anticipate by a year the acquisition of some of this preliminary discipline does not in any way encroach on the time or attention to be given to more strictly medical or technical studies; but rather, by clearing the way for these in advance, permits the years passed at the medical centre to be more fully occupied by the studies proper to the medical art. I am far from assuming that no errors have been committed, or that there is not a good deal to be said on both sides; but from what I have already laid before you in this discourse, you will be prepared for the statement that I could not approve of anything that would tend to discourage the teaching of elementary science in English schools; and on this ground I voted with the minority on this occasion. I think the future is with the English colleges in this matter, and I trust they will persevere.

I have now only, Gentlemen, to congratulate you on your appearance in a school so well furnished in all its departments as Mason College, with whose origin and early progress one of my oldest friends, the late Dr. Heslop, was so closely associated that my interest in it may be said to date back to a period when I was still an Edinburgh man, an extra-academical teacher and hospital physician, and not a Glasgow University professor. I most cordially hope, for you, that the great scheme of a Midland University with which this school is ever to be associated, may be successfully carried out; and meanwhile, I would join in the welcome extended to you by all your teachers, and in the anticipation of a prosperous and successful session.

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